Illinois Commerce Commission

Assessment of Commonwealth Edison Company

1999 Reliability Report

Pursuant to 83 Ill. Adm. Code 411.140

March 2001

1. Executive Summary

Beginning with the year 1999, and at least every three years thereafter, 83 Ill. Adm. Code 411.140 requires the Commission to assess the annual reliability report of each jurisdictional entity and evaluate its reliability performance. This document assesses Commonwealth Edison Company's ("ComEd") second annual reliability report which was filed on June 1, 2000.

Assessment of Reliability Report

ComEd's "1999 Electric Power Delivery Reliability Report" ("Reliability Report"), submitted on June 1, 2000, responded to all requirements contained in 83 Ill. Adm. Code 411 ("Part 411"). ComEd divided its Reliability Report by referencing the applicable subparts of Part 411. This format made locating information quite easy.

Even though ComEd did respond to all the requirements specified in Part 411, portions of the information were inadequate to fully assess planned actions to improve their reliability. To enhance the usefulness of the annual reliability report, the Commission recommends that beginning with the year 2000 reliability report, to be filed June 1, 2001, ComEd incorporate the following changes in its annual reliability report:

ComEd should state its overall reliability goals and reference the specific reliability projects to these goals. The referenced goals should define the criteria used to select and prioritize each project.

ComEd is using industry-wide percentages to determine the number of interruptions that are controllable. ComEd should start to classify controllable interruptions based on the facts surrounding each interruption.

ComEd should improve its description of the planned corrective actions for worst performing circuits and overloaded transformers. ComEd should provide more case specific actions and stating how these actions will improve reliability.

ComEd's Historical Performance Relative to Established Reliability Targets

Part 411.140(b)(4)(A)-(C) establishes reliability targets based on the last three years of performance. Part 411.120(b)(3)(K)&(L) does not require the utility to report the data necessary to evaluate its performance relative to the reliability targets until June 10, 2001, thus a historical assessment based on these targets is not yet possible.

The reliability targets defined in Part 411.140(b) are referenced to controllable interruptions only. ComEd must develop the means to classify controllable interruptions on its system based on the facts surrounding each interruption. ComEd currently uses industry recognized percentages to determine which interruptions are controllable. For example, if the industry average for tree contact outages is that 50% are controllable, ComEd

assumes that 50% of its tree contact outages are controllable. The Commission finds the use of industry data to determine the number of controllable outages to be unacceptable.

Trends in ComEd's Reliability Performance

This is ComEd's second annual reliability report. Even though ComEd's 1999 reliability performance has improved appreciably over 1998, with only two years of data it is not possible to determine if the overall reliability trend is improving or not. The 1999 average interruption frequency index (CAIFI) decreased by 23% and the average interruption duration index (CAIDI) decreased by 49% from the 1998 reported indices.

The Commission finds it troubling that over 67% (27 out of 40) of the most loaded transformers listed in 1998 report are repeated in the 1999 report. Likewise, ComEd listed three worst performing circuits in their 1999 reliability report that also appeared on their 1998 worst performing circuits list. The Commission feels that if ComEd had performed satisfactory corrective measures on all of the 1% worst performing circuits and most overloaded transformers listed in their 1998 report, these repeat circuits and transformers would not have reappeared on the 1999 report lists. ComEd should perform the needed corrective measures to reduce the repeat worst performing circuits and most loaded transformers in future reliability reports.

ComEd's Plan to Maintain or Improve Reliability

ComEd appears to have developed an extensive reliability plan that covers almost, if not all aspects of concern with maintaining and improving reliability. However, the Commission finds that even though ComEd's list of projects to address reliability issues is extensive, ComEd does not tie the projects to any clear overall goals and action plans. Therefore understanding the intent of ComEd's plan is very difficult. ComEd should provide further analysis of the expected and achieved results of each reliability project and state how the project will help ComEd achieve a specific goal.

Potential Reliability Problems and Risks

Portions of ComEd's electric distribution system are old and represent a risk to the overall reliability ComEd can provide to its customers. The Commission believes that those customers served from ComEd's older electric distribution system are more susceptible to interruptions and only if ComEd is active in repairing, maintaining and replacing this older equipment will a satisfactory level of reliability be maintained.

Eleven substation transformers listed in ComEd's 1998 Reliability Report that had peak loading that equaled or exceeded 100% of the normal capacity rating reappear on ComEd's 1999 report as being loaded to at least 100%. The Commission is concerned that when a substation transformer load is over their normal capacity rating every year the likelihood that the transformer may fail increases due to the electrical and mechanical stress of the overloading. The increased risk of failure of the transformers also increases the likelihood that the customers served by these transformers will be interrupted.

The number of interruptions caused by trees is largely dependent on the level of tree trimming ComEd performs. As of May 19, 2000, ComEd stated that they have achieved a

four year trimming cycle. If the level of tree trimming is decreased in future years, the Commission believes that any improvement in reliability ComEd is obtaining from its current tree trimming practice will quickly evaporate.

ComEd's Reliability Report shows that animal contact is one of the leading causes of interruptions on its system. Animal caused interruptions increased from 6.2% (2,892 interruptions) of the total interruptions in 1998 to 10.7% (3,852 interruptions) in 1999. ComEd should install protective animal equipment and take other actions necessary to reduce the number of interruptions due to animal contact.

To rectify problems that were found during a self-assessment of its electric system in the fall of 1999, ComEd initiated a large number of system improvement projects. Most of the projects were to be completed prior to the high summer loading period of 2000. Until these projects are completed there is an increased reliability risk to ComEd's electric system. Many of these improvement projects require electric lines to be removed from service to facilitate the construction activities. When some of the main electric lines are out-of-service the system reliability is reduced.

Review of ComEd's Implementation of its Plan for the Previous Reporting Year

During late July and early August 1999, ComEd experienced a number of outages in the Chicago area that were caused by the failure of electric distribution equipment. As a result, ComEd and the Commission started investigations into the cause of these outages as well as a more detailed investigation into ComEd's transmission and distribution system design and maintenance practices. These investigations caused ComEd to drastically alter its future plans for improving the system from the plans contained in the 1998 Reliability Report. The 1999 Reliability Report noted the changes in plans but did not explain which projects were not accomplished.

Summary of Recommendations

The Commission recommends that ComEd take the following actions:

1. Develop the means to classify controllable interruptions on its system based on the facts surrounding each interruption. ComEd currently uses industry recognized percentages to determine which interruptions are controllable. For example, if the industry average for tree contact outages is that 50% are controllable, ComEd assumes that 50% of its tree contact outages are controllable.

2. Maintain the 1999 increased commitment to tree trimming. The Commission believes that any improvement in reliability ComEd is obtaining from its 1999 increased commitment to tree trimming will quickly evaporate if tree trimming is decreased. ComEd stated in their 1999 Reliability Report that as of May 19, 2000, they have achieved a four year tree trimming cycle.

3. Install protective equipment and take other actions necessary to reduce the number of interruptions due to animal contact.

4. Customer opinion of ComEd's customer service decreased in 1999. ComEd should investigate the reasons behind this decline and institute measures to improve customer service.

Furthermore, beginning with the year 2000 reliability report, to be filed on June 1, 2001, ComEd should include the following in its reliability reports:

1. In the plan to maintain or improve reliability, ComEd should define the criteria used to select each project and plan, prioritize the projects and plans, and describe how each proposed project contributes to the overall reliability goals that ComEd is trying to achieve.

2. ComEd's investment plans need clearly stated scopes of work, prioritized listings, and definite completion dates.

3. ComEd should list the planned reliability improvement investments by operating area.

4. ComEd should include in their annual report descriptions of the activities performed on the previous year's projects. ComEd should state which previously reported project goals were not met and provide reasons why the goals were not met.

5. ComEd should provide a list of projects that did not have the planned work completed. The list should also include reason why the planned work was not completed.

6. For each worst performing circuit ComEd should state what specific reliability improvement actions they are planning and when the specific work will be completed by.

7. Include an assessment of specific reliability projects that compares the costs of the project to the expected reliability benefits.

8. Include a list of the planned corrective actions and the amount of load reduction that will result from the actions for all of the transformers loaded at or above 90% of their rating. ComEd should also indicate when the action is scheduled to be completed.

9. ComEd should report the actual and forecasted number of miles of overhead circuits trimmed, and the actual and budgeted funding for tree trimming.

10. ComEd should not change the work categories used to classify each of their capital work plans from year to year.

11. ComEd should explain any reduction in their per customer, annual capital expenditures and budgets and why these reductions will not have a negative impact on their system reliability.

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2. Introduction

Beginning with the year 1999, and at least every three years thereafter, 83 Ill. Adm. Code 411.140 ("Part 411.140") requires the Commission to assess the annual reliability report of each jurisdictional entity and evaluate its reliability performance. Part 411.140 requires the Commission to:

A) Assess the reliability report of each entity.

B) Assess the jurisdictional entity's historical performance relative to established reliability targets.

C) Identify trends in the jurisdictional entity's reliability performance.

D) Evaluate the jurisdictional entity's plan to maintain or improve reliability.

E) Include specific identification, assessment, and recommendations pertaining to any potential reliability problems and risks that the Commission has identified as a result of its evaluation.

F) Include a review of the jurisdictional entity's implementation of its plan for the previous reporting period.

This document assesses ComEd's "1999 Electric Power Delivery Reliability Report" ("Reliability Report"), filed on June 1, 2000, and evaluates ComEd's reliability performance for calendar year 1999. This is ComEd's second annual reliability report filed pursuant to code part 411. The organization of this document follows the order of the above listed requirements.

This document does not include a though review of ComEd's implementation of the plans to maintain or improve reliability that ComEd proposed in its 1998 Reliability Report. The plans in that Reliability Report were replaced by a two year program contained in ComEd's September 15, 1999, "Transmission and Distribution Investigation Report." The two year recovery program contained in the September 15, 1999, report was evaluated in this document only in the context of the scope of how ComEd applied it to their 1999 Reliability Report.

3. Assessment of ComEd's 1999 Reliability Report

ComEd's Reliability Report complied with requirements specified in 83 Ill. Adm. Code 411.120 ("Part 411.120") and 411.210 ("Part 411.210"). ComEd organized the Reliability Report by the applicable subparts of Part 411.120 and 411.210.

Within the Reliability Report ComEd provided tables of reliability indices, plans for future investments, listings of interruptions, listings of all outages that affected 10 or more customers, the age and condition of the system, and a listing of worst performing circuits.

What is not contained in the 1999 Reliability Report is a description of what overall reliability based accomplishment(s) ComEd reached in 1999, the overall reliability goals for year 2000, or a description of the criteria ComEd used in selecting the reliability projects for the next three years. The latter two shortcomings will be addressed in section 6 of this report.

ComEd did report on the work that was performed in 1999 as required by Part 411. What ComEd did not provide is a list of projects that were not completed. ComEd should include in their annual report descriptions of the activities performed on the previous year's projects. The list should also include reason(s) why the planned work was not completed. The Commission also recommends that ComEd should state what overall reliability accomplishments were reached by each of the actions performed during the reporting year.

ComEd listed 36,061 outages[1] that affected 10 or more customers for more than one minute in 1999. ComEd classified the 36,061 outages into 60 interruption cause categories. The following table lists some of the larger categories[2] of reported causes of interruptions for both 1999 and 1998.

Table 1. Causes of Interruptions

	1998 Interruptions		**1999 Interruptions**	
Cause of interruption	Number of Outages	% of total	Number of Outages	% of total
Total	46,289	---	36,061	---
Underground	6,734	14.55%	6,756	18.75%
Animal	2,892	6.25%	3,852	10.68%
Tree	7,770	16.79%	5,005	13.88%
Weather	12,002	25.93%	8,746	24.25%
Other	3,149	6.80%	3,783	10.49%
Unknown	8,418	18.19%	565	1.57%

Three items from Table 1 are worth highlighting; first the total number of interruptions reported by ComEd for 1999 decreased by over 22% from the number reported in the 1998 Report. Secondly, the number of interruption causes that ComEd classified as being "unknown" decreased significantly from 8,418 or 18% of the total 1998 interruptions to 565 or 1.6% of the total 1999 interruptions. Lastly, even though the total number of

[1] Page G-10 of ComEd Reliability Report
[2] Page C-3 of ComEd Report

interruptions went down 22%, three specific causes of interruptions increased from 1998 to 1999; underground, animal and other.

The five categories listed in Table 1 ("underground" through "other") amount to 78% of all interruptions in the Reliability Report. The combination of interruptions ComEd classified as being caused by either "weather" or "other" accounted for over one-third of all outages to ComEd in 1999. These two categories are very vague and reduce the value of the Reliability Report. ComEd should continue to improve its classification of interruptions to provide more meaningful reporting of the data.

Part 411.120(b)(3)(G) states that the utility is to report on the age, current condition, reliability and performance of its existing distribution and transmission system. ComEd's assessment of its performance (based on ComEd's self inspection and the resulting September 15, 1999, "Transmission and Distribution Investigation Report") stated[3];

> *"(in association with the August 1999 outages on ComEd system)… ComEd undertook an intensive inspection of the system. The inspection revealed an extensive array of equipment in need of maintenance and repair, and a number of management and maintenance practices that required immediate remedy.*

The Commission would expect that ComEd's report on the reliability and performance of it's distribution and transmission system to improve as the equipment and management and maintenance practices are improved per the results of the September 15, 1999 report.

To comply with the requirement that a utility report on the age of its existing distribution and transmission systems, ComEd provided age data on seven types of equipment[4]. The age data for each of the seven types of equipment included information on the median age, age distribution and quantity by age. Table 2 lists the median age of the seven types of equipment that ComEd reported.

Table 2. Median Age of Typical Equipment

Wood poles (distribution)	31 years
Steel poles (transmission)	31 years
Lightning arresters	12 years
Distribution crossarms	24 years
Underground cables	14 years
Meters	21 years
Distribution transformers	22 years

The Commission believes that the absolute median age of the existing equipment in service does not provide, by itself, an indication of possible reduction in reliability performance of the distribution or transmission systems. The age of the equipment in combination with an increase in the number of outages due to equipment failures or malfunction would provide a stronger basis to state if equipment is deteriorating and reducing the reliability of the electric system.

[3] Page G-1 of ComEd Report
[4] Page G-4 through G-6 of ComEd Report

Part 411.120(b)(3)(G)(v) states that the utility is to perform a satisfaction survey covering reliability, customer service and customer understanding of the utility's services and prices. ComEd asked customers to rate its performance on a scale of zero to ten, with ten being most satisfied. Table 3 lists the results of ComEd's customer satisfaction survey for 1998 and 1999[5]. For the Reliability Report, ComEd defined a positive response as any response above a five rating.

Table 3. Survey Results
(Percent Positive Response)

Customer Class		Average 1998	Average 1999
Residential	Reliable Electric Service	80%	72%
	Customer Service	74%	70%
Small Commercial & Industrial	Reliable Electric Service	72%	66%
	Customer Service	60%	60%
Large Commercial & Industrial	Reliable Electric Service	65%	68%
	Customer Service	66%	61%

ComEd performed customer satisfaction surveys in each of the four quarters of 1999. ComEd stated that the percentage of positive responses declined in the 3rd quarter due to the power outages in the City of Chicago. Only one of six customer categories (Large Commercial & Industrial - Reliable Electric Service) listed on Table 3 did the average percent of positive responses increase from 1998 to 1999. Table 3 lists the average for all four quarters.

The Commission finds the results of this survey troubling, but not surprising. Both residential and small commercial customer perception of their service reliability decreased by 10% from the 1998 survey results. For the third quarter of 1999 only 52% of the Chicago residential customers surveyed rated ComEd's reliability above a five rating.

The Commission recommends that ComEd focus on improving the customer service. ComEd should implement actions to improve customer's judgment of ComEd's customer service and report what actions were implemented in the 2000 report. When more than one in every three customers surveyed rates ComEd's customer service as being non-positive, and the percent of non-positive responses increased from the previous year's results, ComEd should be initiating and listing planned corrective actions in their annual reliability report.

[5] Page G-13 in 1999 and page 42 in 1998 ComEd Report

4. ComEd's Historical Performance Relative to established Reliability Targets

Part 411.140(b)(4)(A)-(C) sets forth the reliability targets that a jurisdictional entity should strive to meet. These targets specify a certain number of outages as well as hours of outage that a utility should strive to meet on a per customer basis. However, Part 411.120(b)(3)(K)&(L) does not require the utility to report individual customer outage data until 2001. Table 5 summarizes the reliability targets defined in Part 411.140(b)(4)(A)-(C).

Table 5. Service Reliability Targets

Immediate primary source of service operation level	Maximum number of controllable interruptions in each of the last three consecutive years	Maximum hours of total interruption duration due to controllable interruptions in each of the last three years
at 69kV or above	3	9
between 15kV & 69kV	4	12
at 15kV or below	6	18

The service reliability targets above apply to only "controllable interruptions." A controllable interruption is defined in Part 411.20 as:

> *an interruption caused or exacerbated in scope and duration by the condition of facilities, equipment, or premises owned or operated by a jurisdictional entity, or by the action or inaction of persons under a jurisdictional entity's control and that could have been prevented through the use of generally accepted engineering, construction, or maintenance practices.*

ComEd uses a statistical method to determine the number of interruptions that are to be classified as controllable.[6] For example, if the industry average for tree contact outages is that 50% are controllable, ComEd assumes that 50% of its tree contact outages are controllable. ComEd does not examine each outage and independently determine if it is controllable.

Using the industry data, ComEd classified 8,215 or approximately 22% of the total 36,061 interruptions as controllable. The Commission finds the use of industry data to determine the number of controllable outages to be unacceptable. The source and accuracy of the industry data is unknown, as is the applicability of the data to ComEd's system. For future reports, beginning with the year 2001 reliability report, ComEd must develop the means to classify controllable interruptions on its system based on the facts surrounding each interruption.

Part 411.120(b)(3)(I)&(J) requires the reporting utility to list its worst performing circuits (subsection I) and then state (subsection J) what corrective actions are planned to improve the circuits performance. ComEd selected its worst performing circuits from those

[6] Page D-1 of ComEd report.

distribution circuits with the lowest performance (highest reliability index scores) from each operating area and for each of the three reliability indices. This list totaled 105 circuits and ComEd classified them as its lowest 1% performers. Per subsection J, ComEd listed the date, number of customers affected, length of time, and cause of each outage for each of the 105 circuits. All of the work planned, for the 105 circuits, was to be completed by December 31, 2000.

Also in compliance with subsection J, ComEd described the corrective actions taken or planned to improve the performance of these 105 circuits. The Commission finds ComEd's planned corrective actions for each circuit to be generic and do not address specific causes of interruptions on each circuit. ComEd should state, beginning with the year 2000 reliability report, what specific actions they have planned or have taken to improve the performance of each worst performing circuit.

To evaluate ComEd's planned and completed actions, Commission Staff requested detailed maps and work order information for nine circuits, from which five circuits were inspected. Circuits from each operating area of ComEd were selected. The purpose of the inspections was for Staff to verify that work was performed on the circuits and to see if there were any visible reasons for the poor performance of the circuits. For example, Staff looked for poor tree trimming practices, broken equipment, rotten poles, slack spans (sagging lines) etc. The following five paragraphs describe the results of the field inspections of the five selected circuits.

Suburban circuit inspections

The Commission Staff inspected three suburban circuits. Two of the circuits Calumet Park, circuit G7683 and Oak Forest, circuit G6188 are south of the City of Chicago. The third circuit is in the northwest suburb of Hawthorn Wood, circuit E4816. All three of the circuits reported tree, animal and underground related outages in the 1999 report. Circuits G6188[7] and E4816[8] both reported 16 interruptions in 1999 of which over half were caused by storms, trees or animals. Both circuits reported interruptions that lasted just short of 15 hours. Circuit G7683 reported 13 interruptions with the longest interruption being 711 minutes (just less than 12 hours).[9]

The two circuits in the southern suburbs of Chicago (circuits G7683 & G6188) are on the rear lot lines in the residential subdivisions. These subdivisions are 20 to 30 years old and have many mature trees in very close proximity to the electric lines. The inspection of these two circuits found evidence of new utility construction and a large amount of tree trimming. As of September 2000, ComEd was still working on both circuits, ComEd did indicate that all work would be finished by December 31, 2000.

The one suburban circuit located in the northwest suburb of Hawthorn Hills is also in a heavily treed area which required an extensive amount of tree trimming. ComEd's construction and repair work was evident the entire length of this circuit. It appeared that

[7] Page J-62 of ComEd Report
[8] Page J-48 of ComEd Report
[9] Page J-64 of ComEd Report

ComEd had completed all of the specified corrective work on this circuit prior to the September 2000 inspection.

Chicago circuit inspection.

Commission Staff inspected one circuit within the City of Chicago in September 2000. Circuit L5349 (located in the vicinity of Addison Street and Western Avenue) had 8 interruptions in 1999 of which 6 were caused by trees, storms or wildlife.[10] The longest interruption was for 850 minutes (14 hours). This circuit is almost entirely built in alleyways. The alleyway construction is old and congested. A lot of the hardware, poles and wires are quite old but they appeared to be in adequate condition. The inspection found evidence of recent repair work throughout the circuit. It appeared that ComEd had completed all of the specified corrective work on this circuit prior to the September 2000 inspection.

Rural circuit inspection.

The Commission Staff inspected one predominately rural worst performing circuit in September 2000. Circuit B369 serves an approximate ten square mile area centered about Polo, Illinois which is north of Dixon, Illinois. This circuit had 5 interruptions in 1999 with the longest reported interruption being for 222 minutes (3½ hours).[11] The inspection found many lightning arresters destroyed and pole hardware damaged from storms. The inspection also found many locations where ComEd was in the process of making repairs.

5. Trends in ComEd's Reliability Performance

This is ComEd's second annual reliability report filed pursuant to code part 411. Even though ComEd's 1999 reliability performance has improved appreciably over 1998, with only two years of data it is not possible to determine if the overall reliability trend is improving or not. The 1999 average interruption frequency index (CAIFI) decreased by 23% and the average interruption duration index (CAIDI) decreased by 49% from the 1998 reported indices.

Prior to 1998 ComEd used connected load to calculate and monitor the reliability performance of its operating areas instead of the number of customers as defined in Part 411. The differences in the reliability information between the reliability indices reported in 1998 and 1999 reliability reports and previous years means no comparisons were made to the 1997 or earlier reliability indices.

Listed on Table 6 are ComEd's reliability indices as reported in the 1999 Reliability Report (for all interruptions).

[10] Page J-14 of ComEd Report
[11] Page J-74 of ComEd Report

Table 6. Reliability Indices for 1999
Indices per Report

	Chicago	Northeast	Southern	Northwest	System
CAIDI (minutes)	199	110	126	114	139
CAIFI (# of interruptions)	1.84	2.07	2.10	2.06	2.03
SAIFI (# of interruptions)	1.26	1.55	1.59	1.56	1.46

SAIFI: System Average Interruption Frequency Index (say' fee). It represents the number of customer outages divided by total system customers.

CAIDI: Customer Average Interruption Duration Report (cay' dee). It represents, for customers that actually had an interruption, how long, on average, the interruptions lasted.

CAIFI: Customer Average Interruption Frequency Index (cay' fee). It represents the outage frequency for customers that had outages. If this index is much higher than SAIFI, that suggests a subset of customers experiences several outages.

The reliability indices required by the Commission rules and provided by ComEd include storm related interruptions. Of the three indices, CAIDI, Customer Average Interruption Duration Index, provides the most meaningful information associated with storm related outages. The Commission would expect that the better designed and maintained an electric system is, the smaller the number or magnitude of storm related problems and the quicker the restoration of the electric system resulting in a lower average customer interruption time (CAIDI index).

The Commission has not provided a state-wide definition of what is a major storm event. The Commission recognizes that there may be some value in having a second set of indices that exclude storm related interruptions as a means to trend reliability performance. ComEd's internal definition of what constitutes a major storm is an event that causes interruptions for 10,000 or more ComEd customers for three hours or more.[12] The Commission's review and evaluation of ComEd's internal storm definition is worthwhile if for no other reason than as guidance for the potential development of a state-wide definition.

The Commission notes that ComEd's definition of a severe storm may provide a perverse incentive to not maintain or make timely repairs of ComEd's system. As will be discussed later, ComEd has developed internal reliability goals that exclude severe storm outages. If the system was not maintained such that even minor storms cause large outages (greater than 10,000 customers) or if there were inadequate repair crews such that service restoration took longer than 3 hours, the storm would automatically be counted as a severe storm and the indices would not reflect the outages cause by the storm.

[12] Response to DR ENG 1.21

Listed on Table 7 are the reliability indices ComEd reported in their 1998 report for each of the four operating areas plus system wide. The indices in Table 7 include interruptions associated with storms. All of the 1999 indices were substantially lower than those reported in the 1998 report.

Table 7. Reliability Indices for 1998

	Chicago	Northeast	Southern	Northwest	System
CAIDI (minutes)	355	249	305	162	274
CAIFI (# of interruptions)	2.09	2.97	2.75	2.45	2.63
SAIFI (# of interruptions)	1.26	2.70	2.46	2.04	2.20

For comparison, Table 8 shows all reported Illinois utility reliability indices for 1999. The table shows that ComEd's reliability indices were within the same range of numbers as the other five utilities in the state. For both CAIDI and CAIFI, ComEd's indices were the third best and for SAIFI, ComEd had the second best reliability index number.

Table 8. Comparison of Illinois Utility 1999 Reliability Indices

UTILITY	SAIFI	CAIDI	CAIFI
ComEd	1.46	139	2.03
Illinois Power	1.35	144	1.96
CIPS	1.72	147	2.39
CILCO	1.82	128	2.35
Union Electric	1.55	169	2.24
MidAmerican	1.62	110	1.95

ComEd stated that their internal, financial incentive goals for reliability relative to the SAIFI & CAIDI reliability indices (excluding major storm interruptions) are a SAIFI of 1.20, and a CAIDI of 100 minutes.[13]

Part 411.210(b)(3) states that each utility having 1,000,000 or more customers is to provide a list of substation transformers that had a peak loading that equaled or exceeded 90% of their rated normal capacity. ComEd complied with the requirements and provided information on the corrective actions planned for those transformers having peak loads of 100% or more of normal rated capacity. ComEd provided a similar listing of substation transformers in their 1998 report.

Twenty-seven (27) of the 40 distribution substation transformers listed in ComEd's 1998 Reliability Report of transformers that had peak loading that equaled or exceeded 90% of the normal capacity rating reappear on ComEd's 1999 report as being loaded to at least

[13] Response to DR ENG 1.22

90%. Of the 27 transformers that appear on both years' reports, 15 had higher peak loads in 1999 that 1998, and 11 had peak loads of greater than 100% of the normal capacity ratings both years. The Commission is concerned that when a substation transformer loading is over their normal capacity rating every year the likelihood that the transformer may fail increases due to electrical and mechanical stress from the overloading.

With over 67% (27 out of 40) of the most loaded transformers listed in 1998 report repeating in the 1999 report, the Commission questions if ComEd either did nothing to try to rectify the high loading problems reported on the transformers or if they just did not do enough. Starting with the 2000 report, ComEd should list the planned corrective actions and the amount of planned load reduction that will result for all the substation transformers loaded at or above 90% of their rating. ComEd should also indicate when the action is scheduled to be completed.

6. ComEd's Plan to Maintain or Improve Reliability

Part 411.120(b)(3)(A) states that the utility is to include a future investment plan within its report. ComEd provided a very extensive investment plan to maintain and improve their system reliability in the 1999 report. ComEd listed 46 specific projects and capital work plans. With 46 different projects, some of which appear to have overlapping scope of work, it is very difficult for the Commission to determine what is ComEd's overall reliability plan. In addition, the report does not contain a description of how the almost 50 projects and capital work plans were selected nor how they contribute to the overall reliability goals. The Commission recommends that beginning with the year 2000 reliability report, ComEd should define what criteria is used to select each project and plan, prioritize the projects and describe how each proposed project contributes to the overall reliability goals that ComEd is trying to achieve.

The future investment plan also did not provide sufficient scheduling information to allow the Commission Staff to monitor ComEd's progress. The investment plans, beginning with the year 2000 reliability report, need clearly stated scopes of work, prioritized listings, and definite completion dates.

ComEd issued two studies that superceded some of the specific projects and the associated investment commitments contained in the 1998 Reliability Report. These two studies delineated the corrective actions ComEd planned to do and the schedule for those actions. The two studies, both dated September 15, 1999, are:

- Transmission and Distribution Investigation Report, and
- City of Chicago Implementation Report.

Some of the work ComEd planned to do in 1999 and in future years is tied to the recommendations and actions in these two reports.

In the 1999 report ComEd changed the names of some of the work categories in their future investment plan from what appeared in the 1998 report. In doing so, ComEd made it very difficult to compare year to year budget and expenditure trends. ComEd should leave

the work categories used to classify each of their capital work plans the same from year to year.

ComEd did not list their improvement plans by operating area. Based on information provided in the 1999 Reliability Report it is not possible for the Commission to determine if all of ComEd's operating areas reliability issues are being addressed equally. ComEd should list the planned reliability improvement investments by operating area.

7. Potential Reliability Problems and Risks

ComEd provided age data for seven common distribution components in its Reliability Report. Within the report, ComEd stated that the median age of its wood distribution poles is 31 years old, with approximately 60,000 poles over 56 years old. ComEd also reported that the median age of its distribution transformers is about 22 years old, with a few units over 56 years old still in use. As demonstrated by this data, portions of ComEd's electric distribution system are old and represent a risk to the overall reliability ComEd can provide to its customers. However, at this time, based on two years' data contained in the Reliability Report, the Commission can not state that the equipment is causing a reduction in reliability. The Commission will monitor equipment age data in future reliability reports.

The number of interruptions caused by trees is largely dependent on the level of tree trimming ComEd performs. As of 2000, ComEd is aggressively trimming trees near its power lines. ComEd stated that as of May 19, 2000 they had achieved a four year cycle of their tree trimming.[14] ComEd also stated that they are committed to maintaining a four year tree trimming cycle. As a means of supporting that commitment, ComEd provided their forecasted tree trimming budget for years 2000-2002.[15] The forecasted budget for tree trimming indicates that adequate funds are being allocated to maintain the four year tree trimming cycle. ComEd should report to the Commission the actual and forecasted number of miles of overhead circuits trimmed, and the actual and budgeted funds for tree trimming. The forecasted information should include, at a minimum, the next three years. The Commission believes that with any decrease in the level of tree trimming in future years, the improvement in reliability ComEd is obtaining from its current tree trimming practice will quickly evaporate.

Twenty-seven (27) of the 40 distribution substation transformers listed in ComEd's 1998 Reliability Report of transformers that had peak loading that equaled or exceeded 90% of the normal capacity rating reappear on ComEd's 1999 report as being loaded to at least 90%. In addition to having 27 transformers that appear on both years reports, 15 of the 27 transformers had higher peak loads in 1999 that 1998, the Commission questions if ComEd either did nothing to try to rectify the high loading problems reported on the transformers or if they just did not do enough. The Commission is concerned that annually loading large substation transformers to near their normal capacity rating may reduce the

[14] Page A-4 of Reliability Report
[15] DR response ENG 1.5

reliability of those transformer and increase the likelihood that the many customers served by these transformers will be interrupted.

ComEd listed three worst performing circuits in their 1999 reliability report that also appeared on their 1998 worst performing circuits list. The Commission believes that if ComEd had performed satisfactory corrective measures on all of the 1% worst performing circuits listed in their 1998 report it would be unlikely that three circuits would reappear on the 1999 worst performing circuit list. The Commission questions how thoroughly ComEd inspected and performed the needed corrective actions to 1the 1998 worst performing circuits. As noted previously in this report, ComEd's planned corrective actions for each circuit were found to be generic and did not address the specific causes of the interruptions, ComEd should rectify these problems in the future reliability reports to the Commission.

ComEd reported that animal contact is one of the leading causes of interruptions on its system. Animal caused interruptions increased from 6.2% (2,892 interruptions) of the total interruptions in 1998 to 10.7% (3,852 interruptions) in 1999. ComEd should install protective animal equipment and take other actions necessary to reduce the number of interruptions due to animal contact.

ComEd revised the scope of work and the deadlines for some of the reliability projects in the 1999 report that were listed in the 1998 report. ComEd does note in Section B, page B-1 of the 1999 report that deviations from the 1998 plans did occur. What the Commission did not find in the report was information that stated what specific projects were delayed or had no activity in 1999 and why these specific projects were not completed. Starting in the 2000 report, ComEd should state which previously reported project goals were not met and provide reasons why the goals were not met.

ComEd's actual capital expenditure, per customer, for distribution decreased each year from 1996 through 1998 (1996 - $92.76, 1997 - $80.64, 1998 - $74.25). The average annual reduction in capital spending per customer for these three years was 12%. In 1999, ComEd spent $107.91 per customer for distribution capital work.[16] To improve or even maintain a level of electric service reliability ComEd should have a consistent commitment to upgrading, expanding, and replacement of facilities. The Commission believes that this commitment would dictate that the annual capital expenditures, at a minimum, should be level if not increasing. ComEd should address in their future reports any reduction in their, per customer, annual capital expenditures and budgets and why these reductions will not produce a negative impact on their system reliability.

8. Summary of Recommendations

The Commission recommends that ComEd take the following actions:

1. Develop the means to classify controllable interruptions based on the facts surrounding each interruption instead of using industry-wide percentages to determine which interruptions are controllable.

[16] DR response ENG 1.8

2. Maintain the 1999 increased commitment to tree trimming. The Commission feels that any improvement in reliability ComEd is obtaining from its 1999 increased commitment to tree trimming will quickly evaporate if tree trimming is decreased.

3. Customer judgement of ComEd's customer service decreased in 1999, ComEd should investigate measures to improve customer service.

4. Install protective equipment and take other actions necessary to reduce the number of interruptions due to animal contact.

Furthermore, beginning with the year 2000 reliability report, to be filed on June 1, 2001, ComEd should include the following in its reliability reports:

1. In the plan to maintain or improve reliability, ComEd should define the criteria used to select each project and plan, prioritize the projects and plans, and describe how each proposed project contributes to the overall reliability goals that ComEd is trying to achieve.

2. ComEd's investment plans need clearly stated scopes of work, prioritized listings, and definite completion dates.

3. ComEd should list the planned reliability improvement investments by operating area.

4. ComEd should include in their annual report descriptions of the activities performed on the previous year's projects. ComEd should state which previously reported project goals were not met and provide reasons why the goals were not met.

5. ComEd should provide a list of projects that did not have the planned work completed. The list should also include reason why the planned work was not completed.

6. For each worst performing circuit ComEd should state what specific reliability improvement actions they are planning and when the specific work will be completed by.

7. Include an assessment of specific reliability projects that compares the costs of the project to the expected reliability benefits.

8. Include a list of the planned corrective actions and the amount of load reduction that will result from the actions for all of the transformers loaded at or above 90% of their rating. ComEd should also indicate when the action is scheduled to be completed.

9. ComEd should report the actual and forecasted number of miles of overhead circuits trimmed, and the actual and budgeted funding for tree trimming.

10. ComEd should not change the work categories used to classify each of their capital work plans from year to year.

11. ComEd should explain any reduction in their per customer, annual capital expenditures and budgets and why these reductions will not have a negative impact on their system reliability.